

COHEN(S-S.)

22

SOME THOUGHTS CONCERNING DISEASE
AND RECOVERY, IN THEIR RELATION
TO THERAPEUTICS,

BY

SOLOMON SOLIS COHEN, A. M., M. D.

Professor of Clinical Medicine and Therapeutics in the Philadelphia Polyclinic; Lecturer
on Clinical Medicine in Jefferson Medical College; Physician to the
Philadelphia and Rush Hospitals, etc.

presented by the author -

ANNUAL ADDRESS

DELIVERED BEFORE THE MEDICAL AND CHIRURGICAL
FACULTY OF MARYLAND,

AT THE 98th ANNUAL SESSION, BALTIMORE, MD.,

April 30th, 1896.



ANNUAL ADDRESS.

SOME THOUGHTS CONCERNING DISEASE AND RECOVERY, IN THEIR RELATION TO THERAPEUTICS.

BY SOLOMON SOLIS COHEN, A. M., M. D.,

*Professor of Clinical Medicine and Therapeutics in the Philadelphia Polyclinic ;
Lecturer on Clinical Medicine in Jefferson Medical College ; Physician
to the Philadelphia and Rush Hospitals, etc.*

Mr. President and Members of the Medical and Chirurgical Faculty: I thank you for your kind reception and for the honor which you have done me in asking me to address you upon this occasion. The comparatively brief period that has elapsed since I received your kind invitation has been unfortunately much encroached upon by college work, and especially the exhausting tedium of examinations, so that I have been compelled to dictate hurriedly the thoughts I have wished to lay before you, and have lacked time to trim away redundancies and repetitions, supply omissions, or endeavor to impart rhetorical polish. Thus, from lack of opportunity to condense, that which was intended as an exordium has grown into a discourse, and I shall have to content myself with but a fragmentary presentation of the important practical applications of the principles sought to be explicated. Some of the difficulties experienced in finding words and phrases that should embody in a definite and intelligible form the views I desire to submit for your consideration, are due to my own inadequacy; but at least a part of the defects and imperfections of the address may, I trust, be generously attributed to the fact that the present state of knowledge in medicine and collateral sciences does not



furnish us with exact and definite words and phrases for the fundamental factors of many of the most important pathologic and therapeutic processes; or in other words, that while in certain trains of observation and induction the first and last terms have been established with a reasonable degree of certainty, intermediate terms are still in doubt and obscurity.

A great authority has defined medicine as "a science that aims at the preservation of health, the cure of diseases, and the physical perfection of man." Exception may well be taken to the use here made of the word "cure"; but we shall all agree, I doubt not, that in the description of the aims of our science, the preservation of health—which is as much more than the prevention of disease as a positive aim is always more than a merely negative one—rightly occupies the first place. I have never admitted the correctness of that classification or nomenclature which separates prophylaxis from therapeutics, hygiene from treatment. If, therefore, in treating of some of the relations of the therapeutic art with the fundamental sciences, medical and general, and especially with the science of biology, I shall speak little of the preventive and preservative measures which are so distinctly the highest achievements of our science and art, in ancient or in modern times, it is because the principles of prophylaxis and of hygiene are so well recognized that it is unnecessary to dilate upon them; while that for which I shall plead is the formal recognition of like principles and their extension into the study and into the practice of that branch of our science and art to which the name of therapeutics is commonly but erroneously restricted—the management of the sick.

This phrase, the management of the sick, or, as Bigelow puts it, "the safe conduct of the sick," embodies an idea worthy of some elaboration in our present discussion. The ordinary definition of therapeutics as the "healing art" or the "art of treating disease" implies not only the error already reprobated (that the preservation of health is foreign to its scope), but still further restricts, and in restricting misdescribes, the therapeutic aim and method. If healing were always, or under well defined conditions, the work of art, and not, as we well know, the

work of nature, we might speak of an art of healing ; or if disease were an entity, a something existing independently of the powers and operations of the organism in which it is manifested, we might speak of "the treatment of disease." On the other hand, if nature's unaided efforts were always competent to effect recovery, there would be no need of any art or science of therapeutics apart from prophylaxis ; and pathology might be studied as Faraday and our own Joseph Henry studied natural philosophy, simply for the enlargement of knowledge, without any thought of direct, practical application. It is often necessary, however, for art to come to nature's aid, and to endeavor so to manage the organism, the subject of disease—in other words the sick person—that recovery may be surely and completely effected ; and this requires of pathology that it shall discover the processes and results of disease and the processes and results of natural recovery, in order that art may be intelligently guided. But the intelligent guidance of art implies yet more than knowledge ; it implies the analysis of observed facts and their reduction to definite and simple principles, which shall be applicable when mere experience fails, and which shall serve as a guide to unceasing progress. Recognizing thoroughly the imperfections of our knowledge and the limitations of our art, it may nevertheless be asserted that the practice of medicine, notwithstanding the apparent complexity of the problems at times presented to it, is susceptible of being so reduced to definite and simple principles ; or perhaps it would be still better to say that it has been in great degree reduced to such principles, that these principles have in the main been taught by all the great leaders of medical thought throughout medical history, and that their amplification or correction in accordance with modern progress, their coördination with the mass of contemporary knowledge, has been partially effected ; the results waiting only for formal recognition, promulgation, and acceptance. Such formulation is beyond the ambition of this address ; but I shall try to indicate some of the lines upon which it may be worked out.

In so far as I may judge from personal errors, and from

observation of the errors of others, I should say that faults committed in the management of the sick arise as much from lack of theory as from lack of experience or knowledge; or, to state the proposition still more strongly, that a physician thoroughly grounded in pathology, thoroughly skilled in diagnosis, thoroughly conversant with the power of the *materia medica*, yet lacking a sound therapeutic theory, might fail in the management of a case of disease, less from the imperfection of science than from the want of a sure method of availing himself of even the imperfect knowledge of the day. To secure the best clinical results from modern laboratory investigations, medical theory as well as medical practice—in other words the coördinating principles formerly embodied in the lectures upon “The Institutes of Medicine”—must again be taught in our medical schools.

In thus pleading for the recognition of the usefulness, nay the necessity, of therapeutic theory, if we are to progress in the practice of medicine beyond diagnosis, I am not unmindful of the history of the past; rather do I find therein—together with warnings against the construction of hypotheses from insufficient evidence, and against the erection of plausible theories into rigid systems—incentives to the construction of hypotheses and theories that may serve, as it were, for lenses to concentrate and focus upon individual problems the entire light of contemporary knowledge, and proofs of the enduring usefulness of theories reasoned from facts of observation, properly limited and judiciously applied.

The lines of induction from facts of observation to principles of therapeutic theory must come from several sources—from medical history, from clinical experience, from laboratory research in all the special medical sciences, and also from the facts and generalizations of biology. Indeed, I believe the most important work toward which medical teachers and thinkers at the present day can turn their attention, to be the coördination of medical science with the study of life and life-processes in general, in the light of the great advances made during the nineteenth century.

In such studies, prominence must be given not only to the ontogeny, but to the phylogeny, of man. Phylogeny, too, must be understood in its widest sense; for in order to fully comprehend those susceptibilities to disturbance and powers of recovery which form the chief data of the science of medicine, we must know the internal endowments and tendencies and the external circumstances, through the action and reaction of which man has reached his present state, and in how far the same intrinsic and extrinsic agencies are now operative or what modifications they have undergone. This involves, moreover, a study of the fundamental factors concerned in the origin and development of living beings in general, which, like the basic facts of all other sciences, must be sought first in their most simple manifestations—an order which the exigencies of medical practice have hitherto compelled us to reverse, thus greatly increasing the difficulties of the student.

Fifty years ago an attempt to base pathologic and therapeutic doctrines upon the data of biology would have been premature, because the great theory of evolution and the investigations into the development of organic beings stimulated by that theory, were immature and in the controversial stage. And even twenty years ago it would have been unwise, for the reason that the errors and crudities necessarily pertaining to controversial periods, the first struggles of a great truth and the infancy of a new philosophy, were still held with dogmatic insistence by the new converts and untrained disciples of Darwin, Spencer, and Haeckel. But now, not only has the evolutionary doctrine been measurably freed from error, and the main truths thereof firmly established, but on the other hand, what is no less important—for biology, like all other sciences, takes color from the prevailing philosophy—the world of thought has escaped from that abject slavery to Spencer which followed its defeat in the struggle against Darwin. So, too, the correction and improvement of Darwin's doctrines, which that great thinker himself foresaw and hoped for, are in progress. The new school of biologists, with the exception of Wallace and his followers, have become less exclusive partisans of natural

selection ; they have learned to take the truth from Lamarck and combine it with the truth from Darwin, showing development to have proceeded by the operation of natural selection, it is true, but along definite lines and not through the accident of haphazard variations ; the lines of development being the result of habit and use, of action and reaction between organism and environment, and thus based not alone upon the operations of the external world, but also upon the inherent capabilities and tendencies of living matter—the distinguishing characteristic of which is thus shown to be its plasticity ; not, however, a mere passive capacity of being shaped by forces from without, but also the power of directing its own formation by forces acting from within.

This plasticity of living matter—this capability of adjustment and readjustment to changing environment, which remains in the highest degree man's endowment, by virtue of which he has spread and flourished over a wider range and under more diverse conditions than any other terrestrial being, and through which his intellectual, spiritual and social development is apparently capable of indefinite progress—demands the close attention of the physician. It is the fundamental factor underlying all his studies, the principle binding and coördinating them into an organic whole. Anatomy and physiology, comparative and special, exhibit its normal operations and their results. Pathology is concerned with its operations and their results under perverting influences. Diagnosis investigates such perverse operations with the view to discover the means by which they may be recognized and discriminated. Therapeutics studies them to discover in how far they tend to persistence or to recession, and whether, and by what artifices, perversion may be combated and restoration aided ; supplementing this study by an investigation of the modifying effects of all known influences upon vital processes, normal or pathologic. This brings once more into view a fact of the highest importance both in the study and in the practice of medicine—namely, that *disease and recovery are alike vital processes in which the organism itself is the most active agent.*

This principle is neither new nor strange to this Faculty ; it is old, at least, as the sage of Cos, and it has continued to inform the best medical teaching and practice from his time to the present ; and yet too frequently one misses its impress from current literature and current treatment. It would oftentimes seem as though medical writers regarded the human body somewhat as a vessel in which chemic reactions take place when the appropriate ingredients are brought together ; as if it were supposed to be entirely passive in both morbid and recuperative phenomena, undergoing certain deleterious changes through the operation of an active agency termed disease, against which and its results another active agency, the power of drugs, must be invoked if destruction is to be averted. Nothing could be more fallacious, and nothing so hinders our progress toward a true science of therapeutics.

The logical rule that whatever is explicated has been implicated, applies to the problems of medicine no less than to all other human experience. Neither the agents provocative of disease nor the agents used in treatment impart to the organism new qualities or introduce into its operations new powers. Their effect is merely to induce perturbations, and this only in two ways : they may modify that which is habitual, or they may evoke that which is latent ; but for good or for ill, such is the full extent of their action.

Nor is any exception afforded to this statement, even by such violent perturbations as may result in immediate death ; for the necessity of death is implied at birth,* and were the organism not endowed with the capacity to die as well as to live, the process of dissolution could not be effected by external influences. In other words, the very molecular constitution enabling that form of matter which exhibits the phenomena of vitality, and which we therefore speak of as the seat of vital force, to resist for a time ordinary disintegrating influences, subjects this vital matter to the necessity of gradual change,

* "Ah fools, that think not how to all on earth
The very death is born along with birth."

William Morris.

and exposes it to the possibility of sudden disruption, with loss of vital power, and return to the condition of non-vital matter. Such transformation, whether it occur through gradual decay or through sudden violence, physical or chemic, we term death; but, gradual or sudden, it is inevitable, and perturbations causing it can only be said to modify by acceleration the habitual course of events.

Now this method of statement is not a mere metaphysical refinement; it embodies ideas necessary to the understanding of our subject. Modern teachers for a time refused, and indeed some still refuse, to admit the legitimacy of such an expression as "vital force." Vital phenomena were looked upon as purely chemic and mechanic, and the attempt to explain them on any other basis was considered as a survival of superstition or a revival of mysticism. That many of the phenomena occurring in organized beings are chemic and mechanic, none disputes. So do chemic and mechanic phenomena take place in electric batteries and dynamos. But as electric force is a manifestation of universal energy differing from chemic and mechanic forces, though mutually interconvertible with them and with other modes of energy; so vital force, life energy, or, as I have on a previous occasion termed it, *bionergy*,* is a mode of universal energy, differing from, although convertible into, other forms of energy and finding its seat in living matter; but, in the present state of human knowledge, not producible from other forms of energy save through the intermediation of matter already endowed with life.

Upon the fact that bionergy is capable of transformation into chemic and mechanic modes of energy depends the possibility of organic function as distinguished from growth; and upon the converse fact that chemic and mechanic modes of energy may be converted into bionergy depends the possibility of the reconstitution of the organism by nutrition after the exercise of function, and of the successful use of therapeutic measures in

* *A System of Therapeutics* edited by H. A. Hare; article *Tuberculosis*, Vol. I., p. 721, Phila., 1891.

combating the perturbations of disease or in compensating for their effects.

By this method of viewing the manifestations of life, whether in health or in disease, or in the process of transition from health to disease or from disease to health, certain therapeutic principles are seen to emerge. Living matter alone exhibits an opposition to the otherwise universal retrograde metamorphosis of energy—integrating its atomic bonds, as Cope has said, by “antichemism”—that is, with the absorption, and not the dissipation, of motion as manifested by heat. As this is the fundamental condition of anabolism, alike in growth and repair, the necessary connection of repose with constructive and recuperative processes becomes evident, and the therapeutic value of rest is established upon a positive rather than a negative basis; upon fundamental principle rather than on mere empiricism.

Furthermore, as, generally speaking, the agents used in treatment, apart from foods and heat, bring into the organism no new store of energy, though they may unlock its reserves or guide its activities into special directions, and as the exercise of function results in the disintegration of tissue and dissipation of energy—katabolism—the dangers, as well as the legitimate uses, of so-called stimulating remedies become apparent. If, in one instance, the emergency calls for sudden putting forth of force, as when a horse is about to leap over a chasm, and the spur may therefore be imperatively demanded, yet, in another instance, it may be better to avoid such explosive action; and in none can it be continued indefinitely. Diminution of the functional activity of the heart in certain conditions may be a necessary part of the rest of recuperation, and the drugs with which we goad it into function will exhaust rather than strengthen. The oxygen that in a case of lobar pneumonia may aid in supplying the suffering organism with the energy needed to carry on its operations, or that in a case of anemia may similarly improve the nutritive processes, may hasten death by too great excitation of chemic changes in a case of pulmonary tuberculosis. Strychnin, ammonium compounds, alcohol, all of the highest utility in certain emergencies

and in regulated dosage, all serve to exhaust reserve energy when pushed beyond the point at which constructive processes can keep pace with the destructive processes they initiate. If alcohol at times saves the tissues from the combustion of fever, it is as a food, not as a stimulant, and the growing experience of the best physicians is more and more restricting this field of its use.

Similar considerations, both as to the usefulness and the basis of sound therapeutic theory, come into view if the problem be approached from the historic direction. Such a study would give material for many papers. Here we must restrict ourselves to the most sketchy outline. Medical progress, like that of all other human knowledge, has proceeded not in a straight line, but in a spiral, forever returning upon itself, but forever rising to a higher plane. Now, if we seek to discover the axis about which this spiral revolves, and which, therefore, represents the direct path of progress, we find it in the recognition of that power—or rather that constitution, that aggregate of conditions—termed by Hippocrates *φύσις*, by Sydenham *natura*, to which is due the faculty of the organism affected with disease to recover its primal integrity of structure and of function.

In different ages, this faculty has been variously described, variously interpreted, in order to bring its operations within the compass of thought by coördinating them with the general trend of philosophic speculation; the language used depending less upon the facts of observation than upon the prevailing hypotheses of the constitution of the world in general and of life in particular. We are inclined to cavil at some of these methods of expression or interpretation. The *archæus* of Van Helmont is to us the product of a disordered imagination or of superstitious mysticism. We declare that the *anima* of Stahl was an unphilosophic conception, impossible to one entertaining just ideas concerning the operations of the human mind and body; while Cullen's *vis medicatrix et conservatrix naturæ* is a vague expression which explains nothing. Yet which of the terms current in our contemporary philosophy or in our scientific nomenclature will stand better before future generations?

As the languages of nations vary, so do the languages of eras. As he that would translate from a foreign tongue into his own vernacular must saturate himself with the spirit not alone of the author but of the people and the language from which he is translating; so, if we would derive instruction from the students and thinkers of the past, or even if we would only correctly estimate their language, we must try to saturate ourselves with the spirit and the trend of the era, to understand in some degree the contemporaneous development of civilization, the state of arts, letters and sciences, and the predominant philosophic theories. In such a spirit we should find that, however various their language, however different upon the surface their explanations, however contradictory or inconsistent at certain points their systems, however much of the false and the ephemeral may have been combined with the true and permanent, yet Hippocrates and Van Helmont, Sydenham and Stahl and Hoffmann and Boerhaave and Cullen, and even the erratic Paracelsus, were at one in recognizing that great factor that lies at the basis of medical science and therapeutic progress—in recognizing the fact that the power of the human body to return to health, that which the unthinking call “cure” and the philosophic “recovery,” comes from within and not from without, as a natural endowment and not as a gift of art.

Attempting to place this principle in language harmonizing with the generally accepted views of our own day, it may be well to consider more particularly for a moment what we mean by nature, what we mean by health and disease, and what we mean by recovery.

Nature to us is not a personality or a power, though the term may be thus used conventionally or metaphorically. Whatever view we may take of the origin of the universe, whether we believe with the inspired poet of old, that “In the beginning God created the heavens and the earth” and all that they contain, or whether we are content with that narrower view which looks upon the Power behind phenomena as equally unknowing and unknowable, yet in scientific language we can only mean by nature “the totality of observed [or possible]

coexistences and sequences." We say that it is nature which in spring renews the beauty of the earth, making the bird to sing to his mate, the flower to yield its fragrance; by which we mean that this association of events has regularly recurred during the entire period of remembered or recorded human observation, and that hence we expect it to continue to recur as a matter of course. So when we speak of recovery from sickness as being due to nature, we can only mean that it is the ordinary course of events for the disturbances we call disease to subside and the state of order we call health to be re-established, and that this takes place because it is a necessity following from the constitution of the world in general and of living beings in particular.

When we speak of health and of disease we do not speak of entities or forces, but of states of the organism. It is usual to define each of these states by negating the other: He is in a state of health who is not sick; and he is in a state of disease who is not well. And perhaps no definition can be constructed that upon final analysis shall be any more satisfactory. We may nevertheless try to describe the states that we term health and disease in such a way as to bring out more clearly the relations in which they are contrasted.

We speak of health and disease only in relation to living beings, and perhaps the best definition of health is one based upon Mr. Herbert Spencer's definition of life. Life, according to Mr. Spencer, consists in the continual adjustment of internal relations to external relations. This statement, removed from its context, may not appear very lucid at first glance, but reflection will show that it embodies a profound truth. The living being, in order to maintain life, must be in a state of continual adjustment and readjustment with his environment, the external world. If, for example, the external temperature falls, the nervous system and other thermogenetic mechanisms of a warm-blooded animal must be brought into activity, so that, manufacturing more heat, he is able to maintain his temperature at its normal level despite the fact that the external cold increases his heat-loss; while heat-loss may likewise be in

some degree controlled by the constriction of peripheral vessels and other physiologic reactions. This is an adjustment of internal relations to an external relation, the external relation being that of low temperature, the internal relations adjusted to it being those of the thermal mechanism of the animal. A further example quite pertinent to our studies may be found in the reaction of an animal invaded by pathogenic micro-organisms, let us say diphtheria bacilli. The first result is the production of a poisonous product, called, in the case supposed, diphtheria poison or diphthero-toxin. Thus far we may suppose the invaded organism, *quâ* organism, to be passive, the effect being biologic on the part of the microbes but chemic on the part of the animal tissues. If the production of toxin were allowed to proceed unchecked, and if nothing intervened to expel, antagonize, or neutralize it, the animal would die; but the life energy comes into play—the cells and fluids, whether directly or indirectly, through nerve stimulus or by chemic or more recondite process, react further against the toxin, and, to use Spencer's language, "adjusting" themselves to it, produce an antagonistic substance, called, therefore, antitoxin. The antitoxin counteracts the effects of the toxin, and if it is produced with sufficient rapidity and in sufficient quantity the animal recovers. Thus the maintenance of life depends upon the power of the animal to adjust its internal relations to the varying relations of the external world. *Health is that condition in which this adjustment may most readily be maintained.*

An imperfect or disordered mechanism of heat-regulation or heat-production, nervous or vascular, may react imperfectly or excessively to the stimulus of external cold, and lowering of temperature, general or local, result, with profound lesions or perhaps a lethal termination. The power to produce antitoxin may be wanting or impaired through some failure of the delicate mechanism of co-ordination, and death thus be inevitable. But further than this, during the period occupied by the reaction that is to restore the adjustment between an animal and its environment, there is often a disturbance—in part physical and chemic, but essentially biologic—of the relations of its

functions to each other. Such derangement may be the direct result of the change in external relations—in the cases supposed, the change of temperature or the activity of the microbes—or an indirect result of the excessive or diminished activity of some particular function or functions thrown out of relation with the rest: thus, in the case of diphtheria, fever indicates a derangement of thermic relations which may be due to excessive heat-production or diminished heat-loss, or both, while dyspnea shows a derangement of relations in which lessened respiratory function and increased muscular function are mingled. This *disturbance of internal relations* we term disease; some of its manifestations exhibiting a tendency to the impairment or termination of life, others being evidences of the struggle to restore the adjustment between internal and external relations, and therefore tending to the preservation and perfection of life—a point not of mere theoretic significance, but always to be borne in mind by the practical physician: for it is obvious that with respect to the one class of disturbances, those tending to the impairment or termination of life, therapeutic intervention may be required to oppose them; while in respect to the other class, those tending to the preservation and perfection of life, therapeutic intervention will either be unnecessary, or, if required, will be required to regulate or aid, never to oppose.

To repeat: *Health is the balanced condition of internal relations*, that state in which, with integrity of structure, all the functions of the body are performed, each with reference to the other, at proper times and in a proper manner, so that internal equilibrium is preserved; and *disease* is the opposite of this:—*any state in which, usually with concomitant alteration of structure, there is an excess or defect of one or more functions in relation to others*, whether such perversion (excess or defect) be manifested in time, in quantity, or in quality.

Such being our conception of health and of disease, it is evident that the state which we call disease may be brought about in various ways—from failure of internal adjustments (autogenetically, intrinsically); from failure to react properly

to changes in external relations ; or in the process of reaction and readjustment (heterogenetically, extrinsically) ; and will exhibit a multiplicity of phenomena. Certain of these phenomena we find to be commonly associated and to have common antecedents ; and grouping together such common associations of sequence and coexistence we erect them into what we term diseases. It is unfortunate that the same word should be thus used to denote the general state of unhealth and the association of special phenomena or relations of unhealth. For upon a clear understanding of the difference between disease and diseases depends much of our knowledge of medical principles, and the indiscriminate use of the one word leads often to an ambiguity of expression only to be avoided by awkward periphrasis.

Ambiguity of expression can scarcely fail to cause confusion of thought. It was upon such a confusion of terms that the Brunonians and their opponents waged their controversies over the unity or diversity of disease—both being right ; for the state of disease is unquestionably a unit of generalization, while the special diseases are multiple and diverse groups of phenomena—diverse, however, only in their association, not in their basic elements. It may, again, seem that this is a metaphysical refinement without practical bearing. History, however, shows its importance. The Brunonian error of thought led to many errors in treatment, some of which (especially the practice of over-stimulation or ill-timed stimulation in so-called asthenic diseases) traditionally and empirically survive for ill to-day ; perhaps most actively among those who have never heard of Dr. John Brown.

It would be desirable, in any extended explication of the principles of medicine, to devote special attention to the laws of association of symptoms, lesions and causes, by which we are justified in discriminating one train of morbid events from another, as a disease. The failure of all systematic nosologists and nosologies, from the earliest times to the present, might be found to rest upon a more profound basis of fundamental facts and relations than has been generally admitted.

For therapeutic purposes, too, the discovery of such laws would be important, for they would at once increase the factors, and simplify the elements, upon which rational treatment might be based. In this essay, however, I can merely call brief attention to certain etiologic facts already alluded to, but needing some little elaboration.

We have seen that the human organism itself is to be included among the factors of disease; not only in the limited sense admitted by current teaching concerning predisposing causes, or in that very partial and faulty view of the morbid processes excited by micro-organisms which is summed up in the phrase, repeated and reiterated *ad nauseam*, of "seed and soil," but in a far more profound and fundamental relation.

Our common errors of thought and expression in this regard may be traced back to a fundamental error in the method of viewing natural processes as a whole—the separation of matter from force, of the actor from the power, which the schoolmen of mediæval Europe inherited from the Greek philosophers, and which the authority of Descartes long imposed upon the modern world. Advanced investigators in physics of the present day, however, look not, with Aristotle, for "prime movers" but recognize the incessant motion of matter as a manifestation of its own inherent properties. So, too, though habits of language frequently involve us in expressions seemingly contradictory to this rule, it is regarded as unphilosophic to isolate any one of a given number of antecedents, as *the cause* of the sequence following their conjunction.

Mathematicians have always recognized the principles here involved: xy is the product of x and y , whichever may precede in time. So, the complexus we term an infectious disease is the product of the animal organism x and the microbe y ; and is not, as we commonly say, regarding the animal organism as passive, "produced" by y . Now this opens the way to a conception of great importance in therapeutics—that of the multiple etiology of certain diseases that we are inclined to look upon as specific; for example, diphtheria, tuberculosis, and typhoid fever. Given a train of mechanism, for example a clock, it

matters little whether the driving power be weight, spring, or electric action, whether the pendulum be started by a push from the hand or the attraction of a magnet; once the wheels are set in motion they pursue a definite course depending upon their conformation and mutual relations, and the physical laws governing such combinations. So, such of the phenomena of disease as are known to be common sequences of various exciting causes are admittedly to be explained by the constitution of the organism; but may not many of the phenomena for which we seek single exciting causes be similarly the effect of more than one agent? The decision, of course, depends purely upon the evidence attainable; but there is no *a priori* reason why a chain of events essentially the same in each instance should not follow the incidence of any one of several so-called exciting causes. "Such a phenomenon, at all events," says Rolleston, "as a living animal is often enough produced by two or more distinct processes within the limits of the same species: as, for example, from ova of different character, summer ova or winter ova, impregnated or unimpregnated ova; by fission or gemmation; through two different series of metamorphic changes; and such a phenomenon as the production of a particular tissue may depend—in the case of adipose tissue, for example—upon the employment in nature's laboratory of one or the other of two different chemical compounds." Similarly, Cope points out that in animals of different orders, identical structures may come into being by different evolutionary routes. As regards diseases, moreover, recent researches upon the etiology of cholera infantum have demonstrated its specificity to be rather on the side of the attacked than the attacking organism, and Vaughan's investigations have made a similar view as to typhoid fever at least worthy of discussion.

Another important feature in the synthesis of disease in complex organisms such as the human body, needs likewise to be considered. The body is made up of organs, the organs of tissues, the tissues of cells, the cells being that from which all else proceeds. In addition to the life of the organism as a

whole, each cell has its own independent life, just as the individual man in a community has his independent life. The life of the organism depends upon that of the cells, and that of the cells upon that of each other and of the organism as a whole. Hence results not only the evolution and importance of communicative and coördinating mechanisms (the vascular and nervous structures), but likewise the production of widespread perturbations from disturbances of a single part; such perturbations, as we have seen, following a certain chain of association independent of the exciting cause. Further, an important difference between the cell life when isolated as an entirely independent unity, and the cell life when continuing in a community, relates to the disposal of waste, whether produced by the chemic decomposition incident to the exercise of function or by the rejection from the absorbed materials of those unsuited for nutriment. The isolated cell discharges these directly into the outer world; the associated cell often discharges them into the vascular channels of the organism of which it is a part. Each cell must, therefore, have become habituated to endure the presence of the ordinary excreta of other cells, and indeed some of these are utilized nutritively or as stimulants of function, or in other ways not clear, by special organs or by the organism at large.

If, however, such excreta become altered quantitatively or qualitatively, or find unusual channels of distribution—perhaps through the lack of one excretion or “internal secretion” that ordinarily modifies or antagonizes the action of another—they may interfere with normal processes or act as excitants of morbid trains of action. All toxins, therefore, are not of extraneous origin, and we have to deal therapeutically with poisonous products of metabolism, autogenetic toxins, in addition to heterogenetic toxins introduced from without, or those that are the result of the action of invading microbes.

The chemic and pathogenic similarity not only of these different classes of toxins, but also of leucomaïnes, ptomaïnes, and vegetable alkaloids, has a fundamental origin in the constitution of living matter and in that vital reaction of the organism

which we find at the basis of all pathologic as well as of all recuperative processes. The natural process of dealing with the products of waste—namely, by excretion—explains many of the symptoms of disease, and justifies not only the ancient doctrines of peccant humors and critical evacuations, but the good old practices of cleansing the *primæ viæ*, of producing therapeutic discharges by the emunctories, and of removing by the lancet useless and waste-laden blood, as in uremia and some cases of pneumonia.

But in speaking of venesection and therapeutic evacuations it may seem that we have become recreant to our faith in the *vis medicalrix naturæ* and are professing allegiance to an usurping *vis medicalrix artis*. It was long ago pointed out that in stating one truth, or rather one phase of universal truth, strongly, we are liable to fall into the error of minimizing other truth. In endeavoring to show that recovery is a natural process, we have perhaps unduly obscured the fact that natural recovery is not always effected; nor when effected is it always complete. In the more detailed study of the subject, therefore, there are many modifying circumstances to be considered. Time will permit in this paper but brief allusion to a few of these. Let us view, for example, the great differences between acute and chronic processes; between those storms which in time pass over, and those slow disturbances and degenerations which persist indefinitely, extending continuously or with alternations of repose. It is quite obvious that whereas under some circumstances the organism, unaided by art, may be capable of adjusting itself to the conditions brought about by the exciting agents of acute diseases, yet the very statement of facts implies that it does not overcome in a similar manner chronic morbid processes. In such chronic conditions, therefore, we have to consider many facts which do not enter into consideration in the acute. The primary exciting cause may have long since ceased to act, as in the tissue-degenerations following certain of the acute infections—for example, syphilis, or some of the varieties of so-called rheumatism. The change brought about in the tissues may be

stationary and in itself of comparatively little consequence, and yet through its location produce disorders by its interference with important functions ; as, for example, changes in the endocardium limited in extent, and which would be unimportant in character were they but situated upon the skin. It is true that natural compensation does take place to great extent in cases of endocardiac lesions, and we know, for example, how life may be prolonged and comfortable with the existence of valvular incompetency ; but such compensation is effected by overgrowth of the cardiac muscle, and in time, even under the most favorable circumstances, ceases to be maintained. Here, therefore, is a proper field for the exercise of art in prolonging the time of compensation and in averting or combating the consequences of failure. Let us suppose, however, that the accidents—that is to say, the unknown antecedents and coexistences—of the primary infection or intoxication have so altered the cardiac valve or orifice that not insufficiency but obstruction is the result ; how much more difficult becomes the effectuation of natural compensation ! how imperfect it usually is, and how much greater care and judgment upon the part of patient and physician are necessary to avert or postpone evil consequences ! Or let us consider the degenerations that take place in organs of secretion and excretion, as the liver or the kidney : the nephritis that follows an acute infection, and in which through tissue-memory, essentially the same fundamental property of bioplasm that permits of progress, the perverted processes persist, and continue to interfere with the important functions of the organ ; or the cirrhosis, whether due to alcohol or to other exciting agent, the immediate influence of which has long since ceased, the more lowly tissue continuing nevertheless to grow at the expense of the more highly organized, checked perhaps, but not brought to an end, by natural processes, and leading to portal engorgement, dropsy, and other well known phenomena. Here, too, the art of the physician is called upon to maintain, so far as he is able, the function of the damaged organ ; to awaken where possible compensatory processes in other organs ; to remove morbid products—toxins and effusions ; to postpone

or to avert the grave consequences of impaired function. Still more difficult problems are presented by the grave degenerations of the nervous system, the sclerosis of the cord, the inductions of the brain, which modern pathologists attribute to the continued results of a past infection. The object of art must be to try to find some means to accomplish the result that nature has been unable to accomplish, and to hold in check the retrograde metamorphosis of tissue. Failing this, endeavors to prolong life and to promote comfort by symptomatic treatment, hygienic and medicinal, are not only justifiable but necessary; and experimentation must be conducted both in the laboratory and at the bedside.

The general problems presented by acute diseases are much simpler, and the power of natural recovery more manifest; yet even here we are compelled to qualify any statement implying the complete efficiency of the organism to recover when unaided by art.

Among the children of civilized nations that chain of disturbances and restoration to which we give the name of measles, is ordinarily of minor importance; with the most simple precautions, and sometimes with none, recovery takes place in the vast majority of cases. Yet we all know the awful fatality of the disease among the natives of New Zealand, when introduced into that island by English newcomers; and even in our own community the death-rate of measles has not become *nil*, nor have we yet succeeded in tracing thoroughly the secondary disorders which it may excite or toward which it may be a predisposing factor. Moreover, we still recognize in this affection, as more dreadfully in others, malignant or fulminant cases in which life succumbs almost without a struggle. Let us consider, moreover, diseases essentially fulminant, such as cholera, which in the preponderance of instances the organism is unequal to combat. What greater contrast, indeed, could be offered than by two diseases, both attributed to the poisonous products of micro-organisms, in both of which the alimentary canal, indeed the intestine, is supposed to be the point of entrance of the infectious agent, both conveyed to large exten

through water contaminated by the excreta of previous cases—cholera and enteric fever! Enteric fever slowly reaching its acme, slowly declining, two-thirds or three-fourths of the patients recovering if left alone; cholera prostrating almost at a single blow, reaction occurring late and suddenly if at all, and failing to be maintained in the greater number even of those cases in which it is manifest. We have learned that art can do much to increase the number of recoveries in typhoid fever by simple measures directed toward the removal of conditions obstructing the natural recuperative process, and which make no attempt at specific destruction or neutralization of the microbe or its products. Here the Hippocratic maxim, "To do good, or to do no harm," is especially applicable. But in cholera we know that art must find some means to supplement nature, when once the natural barrier to infection, the healthful condition of the gastric secretions and of the intestinal mucous membrane, has been broken down. It may be that the intestinal flux in cholera is but the exaggeration of a form of reaction often useful in the expulsion of noxious material, but whether it be so, or be essentially morbid, it is a direct source of danger, to be checked if possible. Not only laboratory but clinical experiments toward the destruction of the pathogenic organisms of cholera, toward the neutralization of toxic products, and toward the mechanic and chemic counteraction of symptomatic dangers, are eminently justifiable—are necessary. While, however, awaiting the discovery of radical or specific remedies, an enlightened art will seek to discern in such a process the main danger and to endeavor to avert this by opposing its mechanism, thus sustaining life while bringing into play that principal element in the natural readjustment—time. The two facts, that even among affections ordinarily mild, fulminant cases may occur, and that even among fulminant diseases cases of spontaneous recovery are known, may here be placed in juxtaposition, and much may be learned from the relation thus made manifest. Given time to bring its reserves into battle, the human organism will conquer the hosts of microscopic invaders. This it has learned to do, during its ages of

evolution, through the operation of the natural laws of action and reaction and the hereditary transmission of acquired properties, in the case of those milder acute affections which still show signs of their ancient virulence when brought among populations hitherto unaccustomed to their presence; for, one of the main facts made clear by the coordination of pathology with biology is that in proportion to the frequency with which given disturbing influences have been encountered and overcome in the evolution of the race, the more fully developed is the reaction apparatus, and the more rapidly and completely is its work performed. The education of the automatic process of defensive reaction is incomplete in the case of fulminant and malignant diseases; yet, nevertheless, though tardy, the power is there, and requires only the opportunity to be brought into exercise.

To return to our illustration of cholera: we observe as the most dangerous train of phenomena—as that against which art must exercise its supporting power until such time as it learns to oppose more directly the proximate or exciting causes of the morbid processes—the rapid removal from the system of its fluids, with consequent loss of heat and inability to effect those mechanic and chemic changes which depend upon the presence of heat and of fluid. The practice of supplying heat and fluid as early, as promptly, and as continuously as possible, by external applications, by enteroclysis, and by hyperdermoclysis, while at the same time endeavoring by the use of appropriate drugs to counteract symptomatically the morbid mechanism or diminish the violence of its action, has accordingly been the most effective means of bringing about recovery in an increasing number of cases; yet the comparatively late introduction of these most important measures into general practice, despite the fact that they have been from time to time advocated by theorists, is a proof that to depend upon empiricism only, without philosophic reflection to direct and interpret it, is to fail of the highest possibility of achievement.

It has been said that fever and its treatment constitute the touchstone of medical theory and practice. Throughout medical history there have been those who taught that the phenomena

of fever were evidences of the reactive power of nature against the agents of disease; and although there have always been others who held opposite theories, this Hippocratic doctrine may be accepted as a final truth. Had this principle been formally taught and thoroughly engrafted in the minds of our profession, we should not recently have witnessed the melancholy abuses of antipyrin and similar agents, of which it may be said that if typhoid fever or influenza has, like Saul, slain its thousands, the antipyretic drugs have, like David, slain their tens of thousands.

The importance of time as a therapeutic element has been alluded to. This finds a striking illustration in that greatest advance of modern therapeutics, which we have already mentioned in illustrating the mechanism of natural reaction, the so-called serum or antitoxin therapy; the production of the agents and their usefulness both involving this factor. While we need not dwell upon the well known details, it may not be amiss to point out that, whereas against such processes as diphtheria, tetanus, scarlet fever, and the like, the method may and should be employed when available, yet the endeavor to treat tuberculosis similarly does not seem to be founded upon a rational basis. The principal, I had almost said the essential, agent in the morbid complexus of tuberculosis is the constitution of the patient, and neither the bacillus nor its toxin. Furthermore, toxemia is one of the latest phenomena in cases of chronic tuberculosis, and in acute tuberculosis the dissemination of the poison and the destruction of the organs is usually so great by the time the toxemia is manifest that there seems to be little chance for antitoxin to act curatively. However, it is well to observe an expectant attitude towards the observations now in progress, and to adopt the method if it should at any time seem to recommend itself through the experience of competent and unbiased physicians.

Another great modern advance is organotherapy, that method—most strikingly typified by the use of extract of thyroid gland in myxedema—which aims to supply deficiencies in the functional activity of certain human organs, principally the ductless

glands, by the administration of substances derived from similar organs in animals. It is not merely the administration of certain products derived from the animal kingdom, similarly to the administration of other products derived from the vegetable and mineral kingdoms, for the sake of certain anatomic and physiologic results which these substances are capable of effecting (extrinsic or heterologous therapy), but it depends upon a closer and more intimate—a more fundamental—relationship between the drug and the functions of the human organism than exists in the other cases (intrinsic or homologous therapy).

It will be observed, however, that the administration of pepsin in indigestion, of thyroid extract in myxedema, of bone-marrow in anemia, of adrenal extract in Addison's disease, and the like, have nothing whatever in common with that pseudo-scientific method through which an unpleasant notoriety was, not long ago, given to the subject of "animal extracts." I have elsewhere* treated this subject at length; here it may suffice to say that the functions of the heart, of the kidneys, and of the brain, and the results of the diseases of these organs, are so different in character from the functions of the thyroid, the adrenal, bone-marrow, and the like, and from the diseases engendered by failure of these functions, that one scarcely sees how the idea arose that the method of therapy scientific in the one case possessed an analogue in the other.

In connection with this subject, a point we have but briefly touched upon may be brought into prominence, namely, that certain pathologic phenomena are partial reversions of function and structure to earlier types in the evolution of the individual or the race: thus patients with acromegaly—a condition associated in some manner, yet obscure, with morbid alteration of the thyroid and pituitary glands, and in some cases apparently controlled by the therapeutic exhibition of preparations of one or the other—exhibit certain striking skeletal resemblances to prehistoric men, such as those of Neanderthal, and to the anthropoid apes.

In connection with disorders of metabolism such as gout and

* *The Philadelphia Polyclinic*, Nov. 15, 1893.

diabetes, this principle of reversion is already recognized by comparative pathologists, and much may be expected from its further development. So, too, in some cases of visceral and neural degeneration, and especially in the domain of psychic disorders, it has been usefully applied in diagnosis and in treatment. That the opposite is also true, however—that disorders which in the present stage of human evolution are looked upon as diseases, may be due to premature progression in certain directions—has not been as yet recognized by the consensus of professional opinion. Certain progressive ophthalmologists have called attention to the influence of that environment we call civilization in the production of errors of refraction, predicting a final adjustment in which spectacle-makers will, with the Moor, wail their occupation gone; but the same principle can be applied much more widely. Disorders of the alimentary canal, like diseases of the teeth, are largely due to a want of harmony between these structures and their present environment, and may be expected to diminish in number and importance as, on the one hand, we learn better to choose and prepare our food, and as, on the other hand, our viscera become modified in construction and function in accordance with the conditions of civilized life. But it is especially in regard to nervous disorders that this principle requires extended study and application; and as the processes and results of degeneration have been exhibited to us in so masterly a manner by Lombroso and Nordau, so should some of our great neurologists analyze and set forth what we may in truth term the factors of regeneration—namely, of that new and higher birth of mind and soul of which man's present state is but the promise.

There are many other facts that should have been considered in a paper of this kind, such as the tissue-changes of inflammation and of neoplasms, and their therapeutic indications; and, in the extending field of mental therapeutics, the legitimate exercise of the powers of mind over body, so long permitted to be abused by miracle-mongers and charlatans; but I have already trespassed too far upon your exceeding patience and courtesy. A few words of retrospect and summary and I shall conclude.

My sermon has been based upon this text from Hippocrates: "The physician must be able to discern the antecedents, know the present, and foretell the future—must meditate these things, and have two special objects in view with regard to disease—namely, to do good, or to do no harm. The art consists in three things: the disease, the patient, and the physician; the physician is the servant of nature, and the patient must combat the disease along with the physician."

In the elaboration of this text, the main thought which I have endeavored to express is this: That, if we hope ever to understand the normal operations of the human body and mind, or their perversions, or the methods by which their perversions may be prevented or corrected, we must be able to bring them into line with the fundamental facts of general biology and to avail ourselves of all the aids which may be gained from collateral sciences. We must understand, so far and so fast as the progress of general biology and allied sciences renders possible, the nature of the life substance and the life force, the modifications which these undergo under various circumstances, and what are the circumstances that are capable of modifying them. We must attain to as full a knowledge as possible of the various stages through which man has passed, physically and mentally, mechanically and morally, not alone in the development of the individual but in that of the race, for only thus can we understand the forces tending to departure from that which we are pleased to call the normal standard; whether in the direction of reversion to more primitive forms and processes or in the faint beginnings of the more complex, which in their full fruition shall enable our posterity to solve without difficulty problems that to us appear inexplicable. We must recognize the dependence of man on his environment, as well as the power of man to modify that environment, and especially must we bear in mind the fact that the evolution of man—the tendency to progress—has been toward the development and improvement of his nervous system, while other parts of his physical organism have remained in a condition less perfect than that of some of his brute relatives; that, in fact, the very

condition of his progress has been not alone the diversion of energy from muscular and osseous systems to the nervous system, but also the maintenance of nervous structures in that plastic state, impressionable to the outer world and responsive to the inner workings, which alone permits of further modification and the assumption of new powers. Thus, in the course of nervous modification, before adjustments to new conditions have been completed, while the evolutionary process is still, as it were, experimenting, before choosing that which will best tend toward the end in view, and while the general plasticity and impressionableness, permitting of the development of variations from which natural selection may choose, remains, we must expect a vast increase in the number of nervous disorders; but we must also learn to distinguish among them, so that we may not misinterpret as evidences of mal-adjustment or degeneration, processes which are the manifestation of a tendency toward readjustment, toward the generation of new powers and new faculties. So distinguishing, we must learn, moreover, to act in harmony with these new developments; for man alone among the vast number of living creatures has the power to consciously modify his environment and control in a measure his own evolution.

Secondly, I have endeavored to show that certain great truths concerning the nature of disease and recovery have been recognized throughout the course of medical history, and have always influenced the best teaching and practice. Here, two principal themes were elaborated:

First, that disease and recovery are vital processes in which the organism plays an active part; in some instances, one continuous process.

Second, that neither morbidic nor therapeutic agents endow the organism with new qualities, or introduce into its operations new powers—as the one, so the other can act only by modifying that which is habitual or evoking that which is latent.

Certain subsidiary facts were found worthy of attention:

1. In disease there are presented two classes of phenomena between which the physician must discriminate: the one, mor-

bid—that is, tending to the destruction or impairment of the organism; the other, salutary—that is, tending towards its preservation and restoration to comfort and usefulness.

2. The tendency of the organism to react in a salutary manner is often sufficient in itself to insure complete and perfect recovery, but it may be either deficient or excessive in several respects, especially as to time, degree, and extent; furthermore, processes salutary in general may be morbid in respect to particular circumstances.

3. When the processes are essentially morbid, or when they become so by excess or deficiency or by circumstances of the individual case, the intervention of art is required to assist, modify, control, or prevent natural processes, to sustain the organism during their evolution, or to avert incidental or sequential dangers or damages.

In such intervention, while we may properly use drugs and must often do so, and while our resources have recently been greatly increased by the utilization of nature's own alexiteria and functional stimulants and regulators, yet we shall learn to place greatest dependence upon those agencies—air, light, water, heat and cold, food, rest, exercise of function physical and mental—which, as the habitual environment of man or his habitual reaction to the environment, have recorded their effects in his line of development, his structure, and his faculties, and are still the most potent influences in his preservation and his progress.

